DOCUMENT RESUME

ED 343 577 IR 015 476

AUTHOR Steinhaus, Kurt A.
TITLE Educational Technology: Kindergarten through Twelfth Grade.
INSTITUTION New Mexico State Dept. of Education, Santa Fe.
PUB DATE Jun 91
NOTE 51p.; For a related report, see IR 015 487.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Computer Software; *Computer Uses in Education; Distance Education; *Educational Technology; Elementary Secondary Education; Long Range Planning; *Microcomputers; School Surveys; *Staff Development; State Departments of Education; Statewide Planning; *Use Studies
IDENTIFIERS *New Mexico

ABSTRACT

This report presents the findings and conclusions of a study of educational technology in New Mexico schools. Designed to provide baseline information to the New Mexico Education Technology Planning Committee, the results of the study will also be used to help make statewide planning decisions concerning educational technology. The findings indicate that: (1) there is a wide range in the level of available educational technology among individual schools; (2) microcomputers are the predominant technological medium currently in use, with audioplayers and television next; (3) distance learning options for most students are limited, with only 10% of the schools having a modem for telecommunications; (4) long range plans for integrating technology need to be developed at each school site; (5) students most often use software for practice, tutorials, and word processing, teachers for word processing, and administrators for instructional management and administrative tasks; (6) the need for staff development is high, particularly in the form of training in computer skills for teachers; (7) funding for educational technology comes from a variety of sources, of which one is the school district; (8) about 85% of the educational technology equipment is well maintained and in good repair; and (9) there is a wide variety of innovative technology applications in both rural and urban schools throughout the state. The report includes a discussion of the design of the study, an inventory of computer use, discussions of curriculum and staff development, and a description of funding efforts. A glossary of terms and a list of schools that responded to the survey are appended. (18 charts) (DB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

Educational Technology

Kindergarten through Twelfth Grade

June 1991

ED343577

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Alan D. Morgan
State Superintendent
of Public Instruction

NEW MEXICO

"PERMISSION TO REPRODUCE T
MATERIAL HAS BEEN GRANTED
Kurt A. Steinhaus

TO THE EDUCATIONAL RESOUR
INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

IR 015 410

Cover: Kindsey Edaakie of the Zuni Pueblo probably doesn't know that technology will play an important role in her education. Her concern at the moment is preparing for the turkey dance at Santa Fe Indian Market.

Photo by Mark Knol
New Mexico Economic &
Tourism Department

New Mexico Education Technology Planning Committee's

Report of

Educational Technology

Kindergarten through Twelfth Grade

June 1991

Published by
New Mexico State Department of Education
Education Building
Santa Fe, New Mexico 87503
(505) 827-3806

Alan D. Morgan
State Superintendent
of Public Instruction

The New Mexico State Board of Education and the State Department of Education do not discriminate with regard to race, culture, ancestry, color, national origin, sex, age, religion, or handicap in their programs or hiring practices.

New Mexico State Board of Education

Lynn Melton Medlin, President

Catherine M. Smith, Vice President

Melvin H. Martinez, Secretary

Don R. Baca. Member
Rudy Castellano, Member
María D. Chávez, Member
Wallace Davis, Member
L. Grady Mayfield, Member
Milo "Mike" McGonagle, Member
Millie Pogna, Member
Emmalou Rodriguez, Member
J. James Sanchez, Member
Gerald W. Thomas, Member
Virginia M. Trujillo, Member
Van W. Witt, Member

Alan D. Morgan
State Superintendent of Public Instruction

Henry E. Gonzales
Executive Assistant to the Superintendent

Jeanne Knight
Associate Superintendent for Learning Services

Stan Rounds
Associate Superintendent for School Management

Michael J. Davis
Assistant Superintendent for Accountability

Tres Giron
Director of Agency Support

Analysis prepared in cooperation with the Los Alamos National Laboratory
Administrative Data Processing Division
Pam French, Deputy Division Leader

Survey instrument developed in cooperation with the
University of New Mexico Center for Technology in Education
Paul Resta, Director

Prepared by
Kurt A. Steinhaus
Educational Consultant

STATE OF NEW MEXICO
DEPARTMENT OF EDUCATION – EDUCATION BUILDING
SANTA FE, NEW MEXICO 87501-2786

June 1, 1991

ALAN D. MORGAN
SUPERINTENDENT OF PUBLIC INSTRUCTION

To All New Mexicans:

I am pleased to present the Education Technology Planning Committee's June 1991 report of Educational Technology Kindergarten through Twelfth Grade. In support of the New Mexico State Department of Education's Vision Statement, I encourage you to review the information presented in this document and become more involved as we continue to improve New Mexico's schools.

The New Mexico State Department of Education's
Vision Statement

> The New Mexico State Department of Education believes the education of all students must become the mission for all New Mexicans. We believe education must challenge all students to reach their potential.

Technology has changed our society and our lives and is bringing us into a new age. Therefore, it is important to examine the educational technologies available in our schools in order to plan for the future. As a state education leader, I recognize the vast potential for integrating technology into the learning process. However, technology should not be viewed as an end in and of itself. Rather, technology should play an integral part in helping students to achieve learning outcomes. This report is one important step in the process of implementing statewide systems and policies to enable and ennoble utilization of educational technology.

I appreciate the efforts of those individuals in our schools who provided the information presented in this report, and look forward to continuing to support the application of technology in the learning process. My special thanks to Kurt Steinhaus for his significant contribution in preparing this publication.

Sincerely,

Alan D. Morgan
State Superintendent
of Public Instruction

Acknowledgments

Many people contributed to the reporting and analysis of information presented in this document. For those unnamed people, thank you.

The New Mexico Education Technology Planning Committee (ETPC) provided guidance and direction in planning the data collection effort. The ETPC is chaired by Robert M. Price, CEO and Chairman of Control Data Corporation (retired). The Survey Subcommittee is chaired by Richard Russey, Director of the Educational Services Unit, Museum of New Mexico. Members of the Survey Subcommittee are Robert Faxon, Jose Griego, Leslie Knowlton, Elizabeth Montoya, Shonie Neal, Paul Resta, Kurt A. Steinhaus, Mary Trainor, and Karen Watkins.

For his thorough work and assistance with data processing and analysis, we thank Douglas A. Evalenko from the Administrative Data Processing Division at Los Alamos National Laboratory.

For her work in helping to edit this document, we thank Sidonie M. DeBruyn.

This study could not have taken place without the extensive efforts of those involved in completing each individual questionnaire. We extend a special thank you to New Mexico's teachers, principals, and support staff who collected and reported information at each individual location. This study is as much for them as it is about them, and we hope they find their efforts repaid at least in part by this publication.

Contents

Executive Summary i

I. INTRODUCTION 1
- Purpose of the Study 2
- Instrument Design 3
- Methodology 3
- Demographics 4

II. INVENTORY 7
- Number of Technologies and Location 7
- Needs 10
- Microcomputers 11
- Distance Learning 12
- Educational Technology in the Home 13

III. CURRICULUM 15
- Plans for Integration 15
- Curriculum Delivery 16
- Software Use 17

IV. STAFF DEVELOPMENT 19
- Faculty Competence 19
- Training Background 20
- Staff Development Needs 21

V. FUNDING 23
- Educational Technology Expenditures 23
- Source and Amount of Funding 24
- Funding Trends 26
- Priorities for Funding 27
- Decision Makers 28
- Maintenance of Equipment 29

VI. INNOVATIVE APPLICATIONS 31

VII. SUMMARY OF FINDINGS AND CONCLUSIONS 33

Appendix A: Glossary of Terms 37

Appendix B: List of Schools that Responded 39

Executive Summary

This executive summary presents the findings and conclusions of the June 1991 publication Educational Technology Kindergarten through Twelfth Grade, a statewide report of educational technology in New Mexico schools. The primary purpose of this study was to provide baseline information for the New Mexico Education Technology Planning Committee (ETPC). This is one of several information gathering efforts by the ETPC designed to present a comprehensive set of information about educational technology.

The information in this report will be used to help make decisions about statewide plans for technology in education. Specifically, the goals of the study were to help answer the following questions.

- What is the current inventory and location of computers, audiovisual equipment, and telecommunications facilities?
- What is the current use of curriculum materials and applications of technology in the classroom?
- What is the level of faculty and staff proficiency in using the educational technology? How are faculty and staff trained and what are the training needs?
- What are the dollar amounts and sources for educational technology funds?
- What are the visions and plans for improving the use of educational technology?

Summary of Findings

This study presents a compelling story of information about the state of educational technology in New Mexico schools. Between individual school sites there is a wide range in the level of available educational technology. Some schools have very limited educational technology resources while others are using technology extensively.

The results are at once encouraging about how schools are beginning to use the tools provided through technology and sobering about the time, effort, cost, and support needed to realize the potential that technology offers in reaching learning outcomes.

Computers are by far the most widespread and most requested educational technology in New Mexico schools. These tend to be located in classrooms and, to a lesser degree, in laboratories. The audioplayer and television are the second and third most common technology. Newer technologies such as computer projection equipment and laser disks are uncommon.

Apple II series computers are the most common computer found in schools. Apple Macintosh computers are far less common; however, sixty-four percent (64%) of the computers in New Mexico schools are Apples. IBM and compatibles represent thirty percent (30%) of the installed base of microcomputers.

A few schools in New Mexico are equipped to provide full motion two-way video, audio, and data transmission. However, distance learning options for most students are very limited. For example, only ten percent (10%) of the schools reported having a modem for telecommunications.

Respondents estimated that over half the students have access to a Video Cassette Recorder at home while about fifteen percent (15%) have access to a computer.

Long-range plans for integrating technology into the classroom need to be developed at each school site. Schools indicating they had educational technology plans rated the plans as valuable or of great value seventy-five percent (75%) of the time.

Business education and Chapter One classes have the largest estimated percentage (38% and 25%, respectively) of instruction delivered using computer technology. Interestingly, when looking at the amount of curriculum presented using all types of educational technology, respondents estimated that each curriculum area is using educational technology an average of at least thirty percent (30%) of the time.

Students most commonly use software for practice and tutorial (34%) and word processing (31%). Computer literacy and problem solving are also important software tools for students. Teachers use word processing most often, while administrators use database, spreadsheet, instructional management, and word processing software.

The need for staff development is high. When rating teachers' proficiency levels for computer use, nearly two thirds of the schools reported that teachers have limited or no computer skills. Inservice and on-the-job training are the most common forms of staff development in educational technology. Vendors are the least common source of training.

Across all types of technology, training in integrating technology into the classroom is the primary staff development need. The need for computer training is more critical than training about video technology.

Results of the report indicate that educational technology funding comes from a variety of sources. It was encouraging to note that the second largest source was the district budget. This indicates that educational technology has become an integral part of the school budget process. The largest funding source is bond/mill levies, which are primarily used to purchase equipment. With the strong need for training, it was surprising to note that staff development receives the least amount of funding.

The trend in educational technology funding is down slightly over the three year period from school year 1989-1990 to 1991-1992. However, longitudinal data collected over a five to ten year period is needed in order to make judgments about significant trends in educational technology spending.

The top identified priorities for technology funding in schools are computer equipment and software. The next priorities are faculty/staff training followed by video equipment and programs. Modifications of the school plant, telecommunications, and video training are rated as the lowest priorities.

The process of assisting principals in making decisions about educational technology usually involves the department chair, individual teachers, and committees. School plans and technology specialists also play an important role in helping the principal to make decisions.

About eighty-five percent (85%) of the educational technology equipment in New Mexico schools is considered to be well maintained or in good repair. This can partly be attributed to the fact that most of the equipment is relatively new.

There is a wide variety of innovative technology applications in rural and urban schools throughout New Mexico. These range from a Department of Energy grant for telecommunications to a project that integrates all core curriculum areas directly into the computer labs.

Conclusions

- Teachers, principals, and other staff are often inspired and motivated by the potential of educational technology applications in reaching learning outcomes.

- Parents and community members are involved in planning as well as assisting with identification of technology applications to meet specific student and staff needs.

- A majority of schools reported plans to increase the integration and use of educational technology into administrative functions and the learning/teaching process. A few schools reported no plans for improving the use of instruction by using technology due to lack of funding.

- Teachers are beginning to use software that: 1) makes the classroom less teacher-centered and more student-centered; 2) opens the world to the classroom through telecommunications; 3) actively involves students in doing and creating projects; 4) helps students do more thinking, interpreting, and analyzing; 5) gives students more individualized instruction; and 6) encourages team-centered research.

- Faculty, staff, and administrator training in technology should be carefully planned and based on identified needs. Follow-up is an important part of staff development programs which is often omitted.

- Research in new software and hardware should recognize the uniqueness and individuality of the school environment and be designed accordingly.

- Resistance to change can be a major obstacle to implementing technology.

- Educational technology can be a catalyst and an integral part of much broader systemic change for improving education.

- To fully implement technology into the learning process, there is a strong need for additional funding, staff development, and support.

I. INTRODUCTION

Our goal is for every classroom teacher to have at their disposal, an entire array of educational technology capabilities, whether it be computers, satellite technology, etc.

- Onate High School, Las Cruces Public Schools

We want every student to have exposure to the computer and leave our building being computer literate.

- Barry Elementary, Clovis Municipal Schools

It is important that teachers feel comfortable with and use the computer for personal and instructional use. Then it will carry on into the classroom.

- Ruth N. Bond Elementary School,
Central Consolidated Schools

My vision is to become fully entrenched in the technology of the twentieth century before we find ourselves in the twenty-first century!

- Grant Middle School, Albuquerque Public Schools

These four schools are among the New Mexico public schools that participated in reporting the current status of educational technology in kindergarten through twelfth grade education.

The story that has emerged from this report is not a simple one. The results are at once encouraging about how schools are beginning to use the tools provided through technology and sobering about the time, effort, cost, and support needed to realize the potential that technology offers in reaching learning outcomes.

Purpose of the Study

The primary purpose of this study was to provide information to the New Mexico Education Technology Planning Committee (ETPC). Empirical evidence is needed by the ETPC in order to formulate a statewide plan for technology in education. The ETPC was established on September 20, 1990 by the State Board of Education and the Commission on Higher Education. The purpose of the ETPC is to "... develop a long-range plan for improving the use of educational technology in order to better facilitate learning by students and adults."

This report examines one particular aspect of technology in education and is part of a larger set of information being gathered by members of the ETPC. Other information being compiled by various ETPC subcommittees includes:

- Educational technology in New Mexico's cultural institutions
- Educational technology in New Mexico's libraries
- Educational technology in New Mexico's colleges and universities
- Research evidence of the effectiveness of educational technology
- Identification of existing technology in education programs in New Mexico and across the nation
- Identification of consortia and organizations for education and technology

This project investigates the following five questions about educational technology in New Mexico's public schools:

- What is the current inventory and location of computers, audiovisual equipment, and telecommunications facilities?

- What is the current use of curriculum materials and applications of technology in the classroom?

- What is the level of faculty and staff proficiency in using the educational technology? How are faculty and staff trained and what are the training needs?

- What are the dollar amounts and sources for educational technology funds?

- What are the visions and plans for improving the use of educational technology?

While the study provides hard data and estimates about these aspects of educational technology in New Mexico, it does not examine the impact of educational technology on learning outcomes nor the application of instructional design in curriculum development and instructional practice. These questions are important but are beyond the scope of this study.

Instrument Design

The Survey Subcommittee of the Education Technology Planning Committee developed the questionnaire used in this study. After considerable research into similar data collection projects across the country, the subcommittee decided to modify the format and questions used in the July 1990 Assessment of Educational Technology Applications in California Public Schools. The design was determined to be a clear and efficient data collection method, thus providing maximum information with the fewest possible number of questions. The survey instrument contains twenty-one questions.

Methodology

The questionnaire was sent to all 658 public schools in New Mexico. A total of 338 usable questionnaires representing 71 of 88 districts was returned in time to be tabulated. These questionnaires provide the data source for this analysis. The response rate of 51% is quite good considering the length and complexity of the questions. A list of respondents by public school district is included in Appendix B.

Questionnaires were also mailed to New Mexico's 115 accredited private schools. Private school information is not reported in this publication because we received only nineteen usable questionnaires -- an insufficient number to present valid conclusions.

A validity study of methodology was conducted by the California Technology Project Assessment Team in 1990 using a similar questionnaire and data collection system. This team conducted on-site visits to collect data, which were aggregated independently from the mailed survey. The results indicate that the self-reported questionnaire data is reliable when compared with the information collected by an on-site interview and count, i.e., there were no significant differences.

Technology is the science of efficient action. For the purposes of this study, educational technology is defined as an integral part of the educational process which enhances learning through the systematic identification, organization, utilization, and management of a full range of learning resources.

This definition addresses not only hardware and software, but also the instructional strategies and delivery systems needed to assure that technology can help to achieve educational goals. When considering the breadth of the definition, a report of educational technology requires consideration of staff proficiency and training, instructional design, materials, equipment, and planning. A glossary of educational technology terms is included in Appendix A.

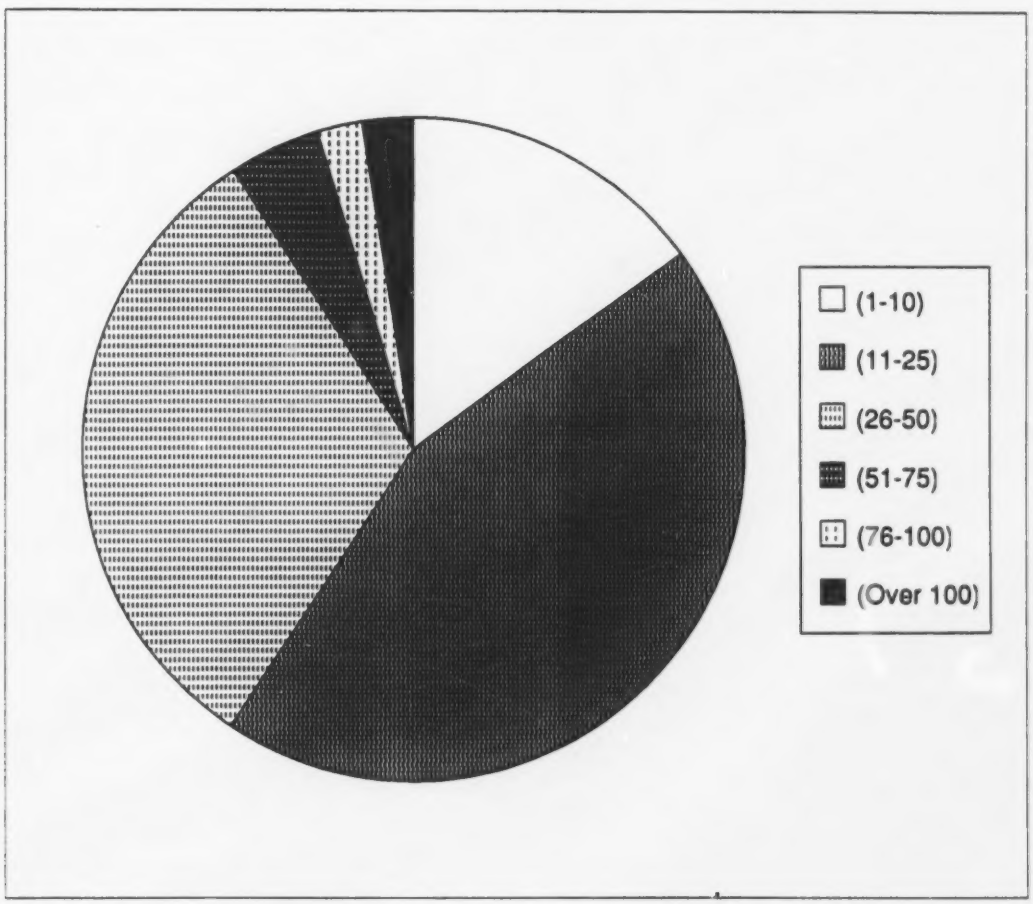
As can be seen in Table 1, the 338 schools in this analysis vary greatly in size, with an average of 28 classrooms attended by 30 faculty. The total number of classrooms exceeds 8,500, with total faculty exceeding 8,900.

Table 1 - Number of Faculty and Classrooms

	Classrooms	Faculty
Total	8,539	8,962
Average	28	30
Minimum	1	1
Maximum	138	148

Chart 1 shows distribution of the sample data broken down in terms of size as measured by the number of classrooms. By far the most common school size is 11 - 25 classrooms; forty-four percent (44%) of the schools reported this information. Thirty-one percent (31%) of the schools have 26 - 50 classrooms, while five percent (5%) have 51 - 75 classrooms. A surprising number of responses were from schools with ten or fewer certified faculty positions -- fifteen percent (15%). Only 4 percent (4%) of the schools are in the combined category of 76 - 100 classrooms and over 100 classrooms.

Chart 1 - Schools by Number of Classrooms

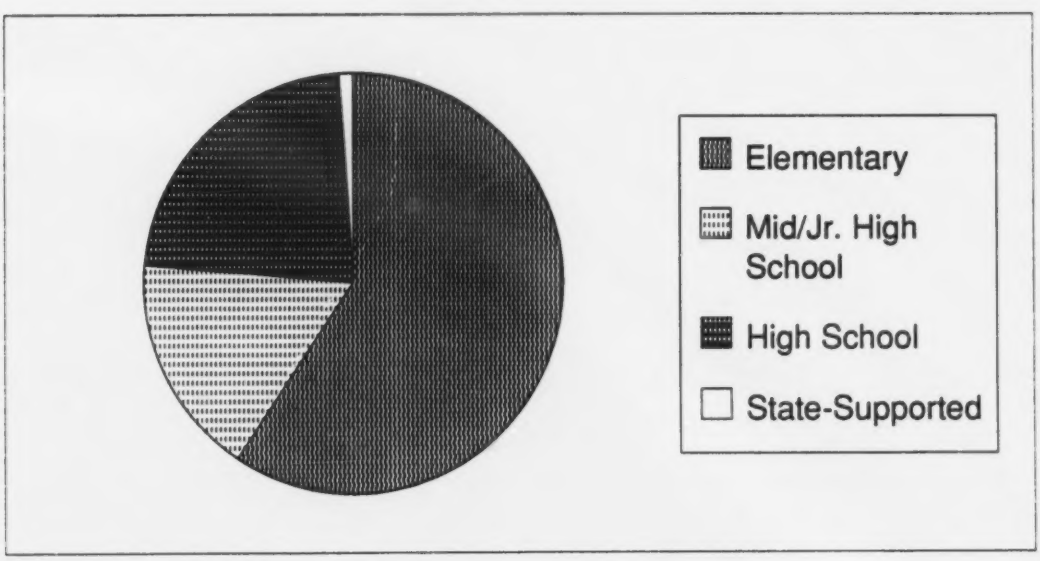


The distribution of school levels is shown in Table 2 and Chart 2. School organizational patterns in New Mexico vary between districts. Elementary schools usually contain grades one through six. The category of Mid/Junior High School represents various structures, such as grades six through eight, seven through eight, or seven through nine. High schools in most medium and large districts contain ninth through twelfth grade students. Small district high schools include up to five levels, grades seven through twelve. The three special state-supported schools in this study are the New Mexico Youth Diagnostic & Development Center and the Secure Treatment Center in Albuquerque, and the New Mexico Military Institute in Roswell.

Table 2 - Number and Percent of Schools that Responded

School Level	# of Schools	Percent
Elementary	201	60%
Mid/Junior High	58	17%
High School	76	22%
Special State-Supported Schools	3	1%
Total	**338**	

Chart 2 - School Levels



II. INVENTORY

One of the primary goals of this study was to determine the educational technology equipment available in New Mexico schools. This section describes the distribution of computing, video, and other audiovisual equipment by location at the school site. Further, the types of computer operating systems in use are identified.

Number of Technologies and Location

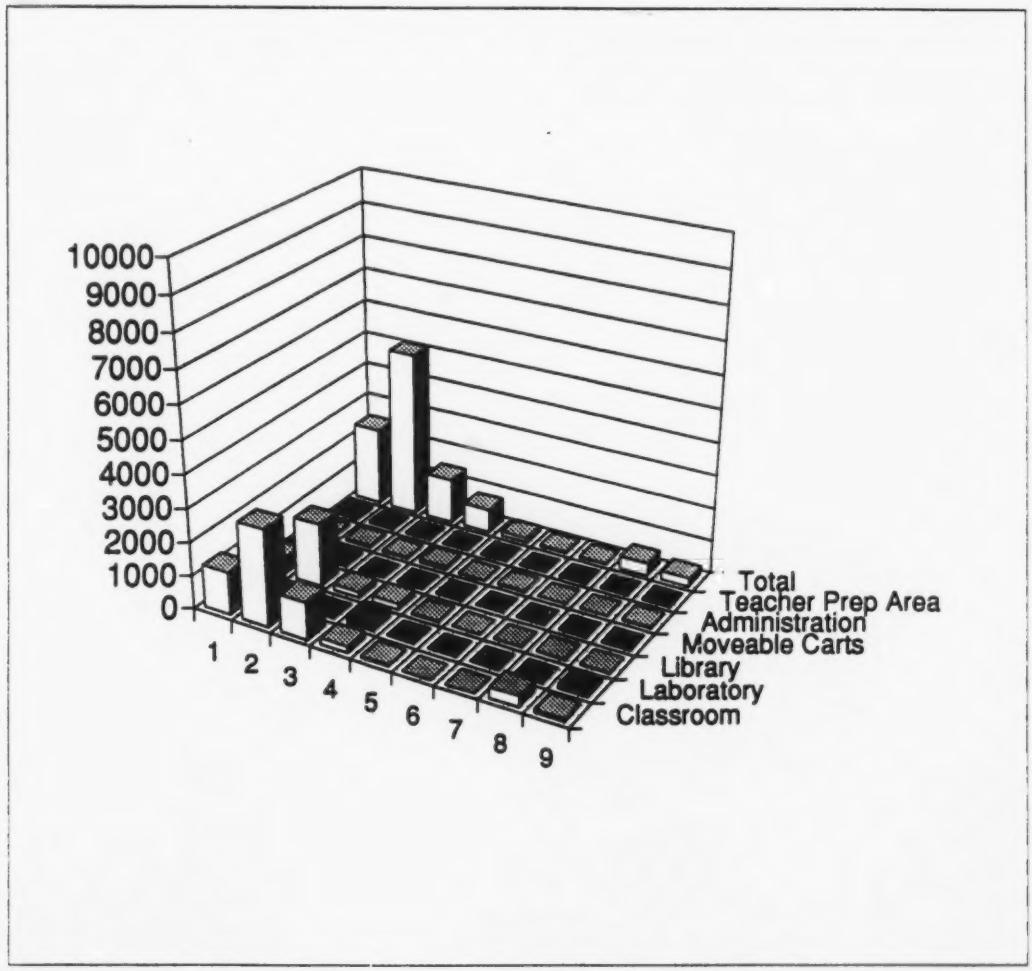
The following table indicates the number and location of different technologies in the schools that responded to the questionnaire. The column labeled **Needs** represents the respondents' perceived needs for additional equipment in the immediate future. See Appendix A for a Glossary of Terms.

Table 3 - Educational Technology Equipment

	Class-room	Labor-atory	Library	Move-able Carts	Admin. Area	Staff Prep Area	Total	Needs
Assistive Technology	1,281	240	465	252	36	106	2,380	1,102
Audioplayer	2,915	109	1,893	43	69	38	5,067	1,704
Cable TV Hookup	1,132	13	171	6	31	13	1,366	871
CD ROM	196	244	175	2	97	1	715	524
Computer Projection Equip.	55	25	32	15	3	1	131	473
Fax Machine	2	0	1	0	34	0	37	129
Fiber Optic Access	7	1	1	0	8	1	18	92
ITFS	340	4	25	0	7	0	376	190
LAN	84	109	17	0	38	3	251	298
Laser Disk	11	4	5	2	3	0	25	287
Microcomputer	4,694	3,526	526	309	582	176	9,813	7,666
Modem	50	31	26	0	57	2	166	278
Satellite Dish Reception	219	3	48	0	14	3	287	113
Telephone	472	47	136	22	1,613	188	2,478	1,761
Television	1,706	18	631	553	28	36	2,972	1,299
Video Camera	59	9	243	18	37	12	378	286
Video Editing Equipment	8	3	29	2	1	0	43	132
VCR	249	19	727	400	24	7	1,426	1,057
WAN	8	9	8	2	8	4	39	126
Total	13,488	4,414	5,159	1,626	2,690	591	27,968	18,388

Chart 3 (part 1) graphically represents a comparison of the number and location of the first nine technologies listed in Table 3.

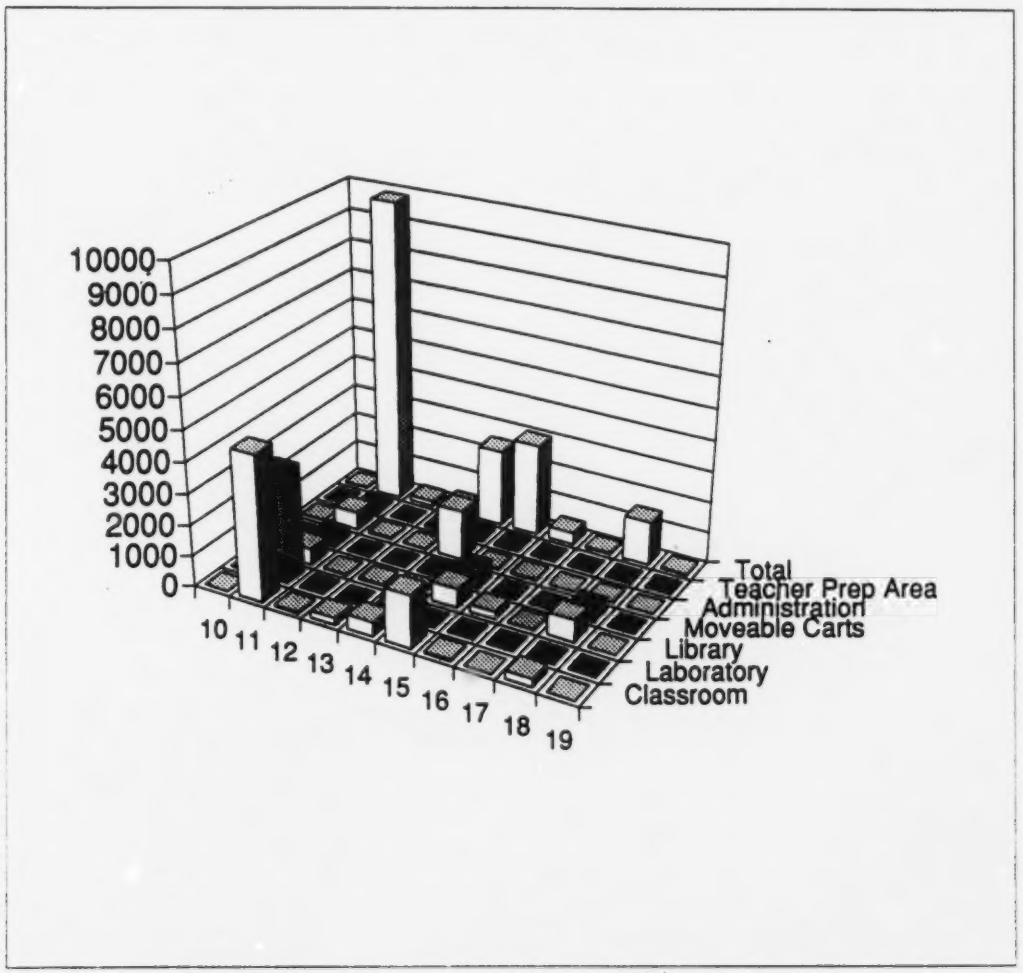
Chart 3 - Educational Technology Equipment (Part 1)



1 Assistive Technology
2 Audioplayer
3 Cable Television Hookup
4 Compact Disk Read-Only Memory
5 Computer Projection Equipment
6 Fax Machine
7 Fiber Optic Access
8 Instructional Television Fixed Service
9 Local Area Network

Chart 3 (part 2) graphically represents a comparison of the number and location of the last ten technologies listed in Table 3. Microcomputers are by far the most common educational technology equipment available in the schools.

Chart 3 - Educational Technology Equipment (Part 2)

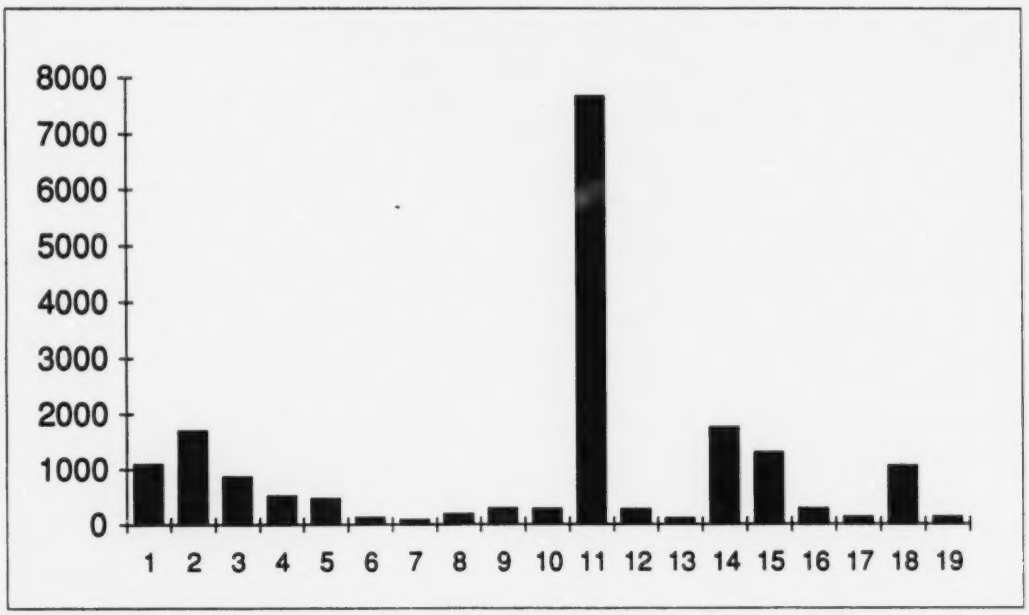


10 Laser Disk
11 Microcomputer
12 Modem
13 Satellite Dish Reception
14 Telephone
15 Television
16 Video Camera
17 Video Editing Equipment
18 Video Cassette Recorder
19 Wide Area Network

Needs

Respondents' perceived needs for additional equipment are displayed in Chart 4. Additional microcomputers are clearly the most requested piece of educational technology equipment. Audioplayers, telephones, televisions, and video cassette recorders are the second most requested items.

Chart 4 - Number of Items Requested



1 Assistive Technology
2 Audioplayer
3 Cable Television Hookup
4 Compact Disk Read-Only Memory
5 Computer Projection Equipment
6 Fax Machine
7 Fiber Optic Access
8 Instructional Television Fixed Service
9 Local Area Network
10 Laser Disk
11 Microcomputer
12 Modem
13 Satellite Dish Reception
14 Telephone
15 Television
16 Video Camera
17 Video Editing Equipment
18 Video Cassette Recorder
19 Wide Area Network

Microcomputers

Microcomputers comprise the largest component of educational technology equipment currently in use. Chart 5 below displays the number of microcomputers by location. Most are located in instructional areas such as the classroom and computer lab.

Chart 5 - Location of Microcomputers

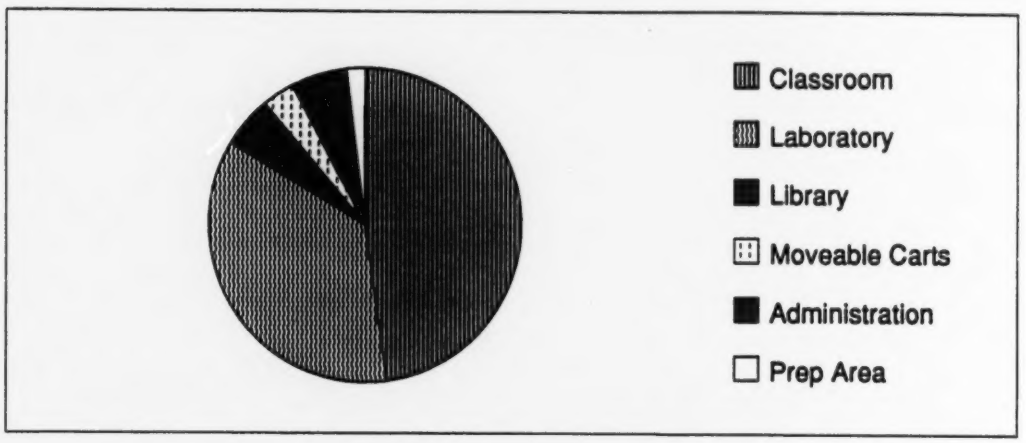
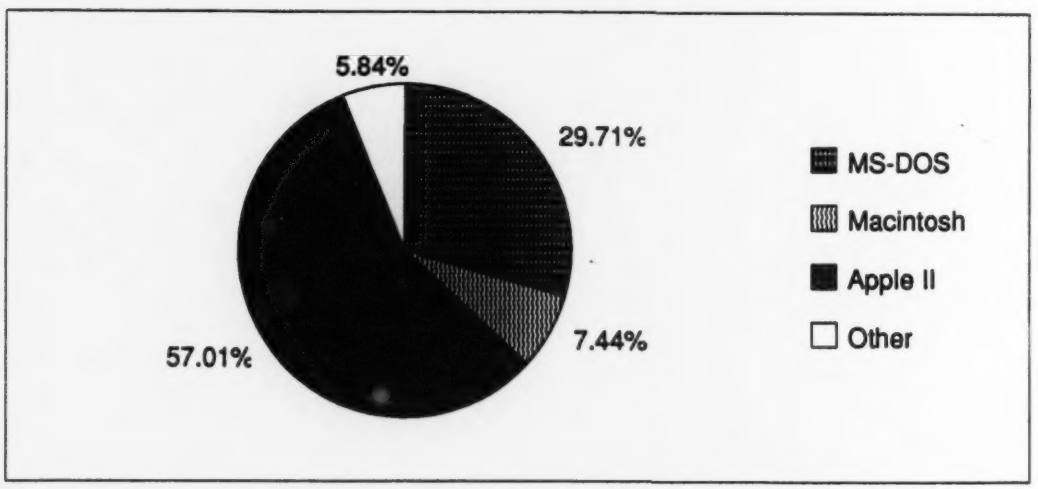


Chart 6 below provides a breakdown of various types of computer operating systems.

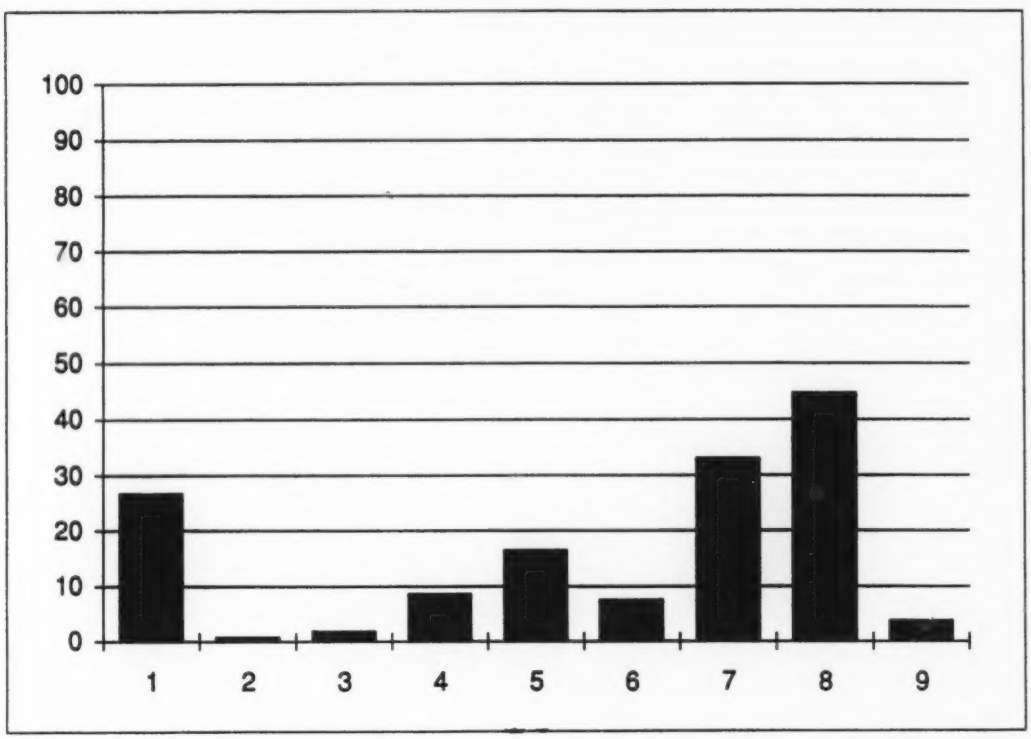
Chart 6 - Microcomputer Systems



Distance Learning

Equipment used by students and teachers for distance learning includes cable hookups, fax machines, fiber optic access, Instructional Television Fixed Service (ITFS), local area networks (LAN), satellite reception, telephones, televisions, and wide area networks (WAN). See Appendix A for a Glossary of Terms.

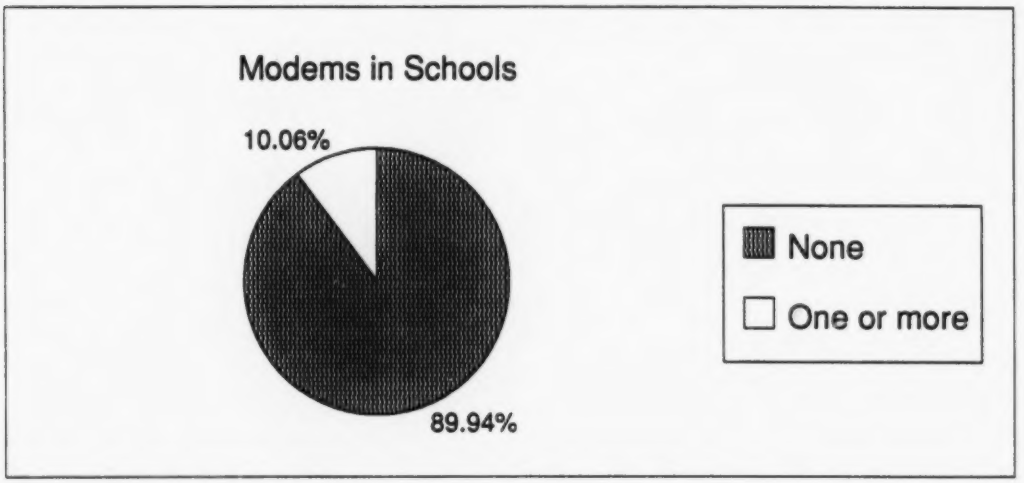
Chart 7 - Percent of Schools with Distance Learning Equipment in One or More Classrooms



1 Cable Television Hookup
2 Fax Machine
3 Fiber Optic Access
4 Instructional Television Fixed Service
5 Local Area Network
6 Satellite Dish Reception
7 Telephone
8 Television
9 Wide Area Network

In addition, modems are important for many distance learning activities. Only ten percent (10%) of the schools reported having one (or more) microcomputer equipped with a modem.

Chart 8



Educational Technology in the Home

Schools were also asked to report students' access to educational technology in the home. Respondents estimated that an average fifteen percent (15%) of the students have access to a computer at home while sixty-three percent (63%) have access to a VCR.

An average of seven percent (7%) of the schools indicated having some type of voice messaging or electronic bulletin board system for communication with students' homes. Most of these schools reported using a truant educational support system for sending messages to parents about students' absences from school.

III. CURRICULUM

The most important questions in this study asked how the equipment is being used to support learning. Integration of educational technology into the curricula was addressed by asking about planning, instruction, and software.

Plans for Integration

Respondents were asked to identify whether there were school and/or district level plans for integrating technology applications into the curriculum.

Table 4 - Percent of Schools with Educational Technology Plans

School Level	District Level
39%	45%

Schools indicating they had plans for integrating technology applications into the curricula were asked to rate the value of the plans in achieving educational goals. Over seventy-five percent (75%) of the schools rated school and district plans as valuable or of great value.

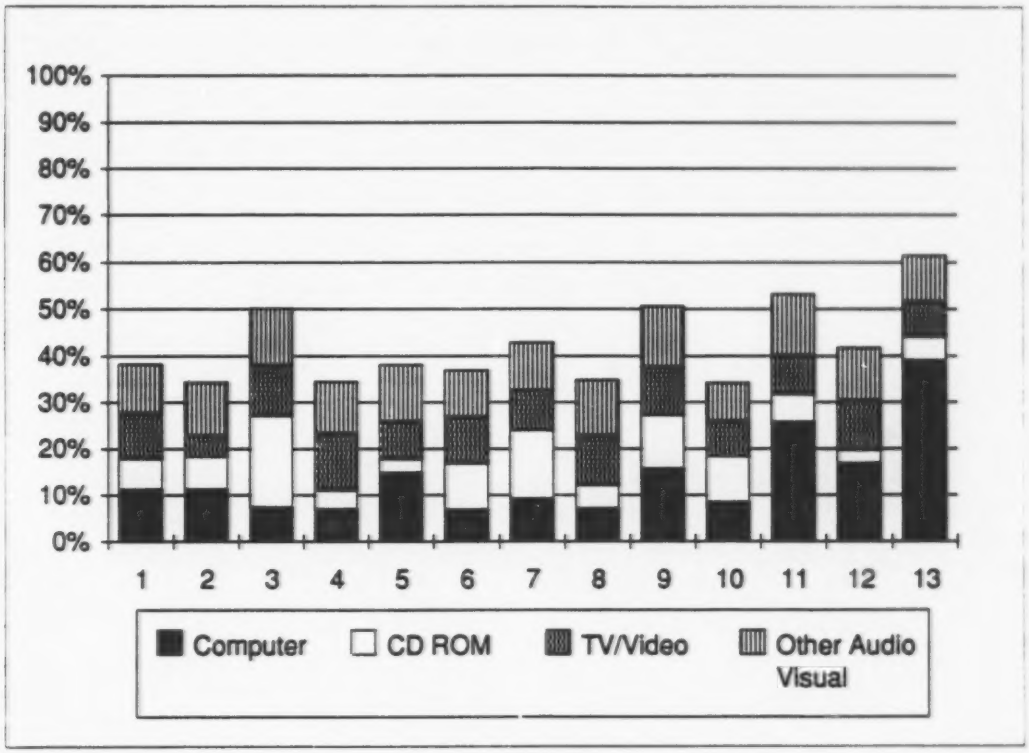
Table 5 - Value of Educational Technology Plans

	Great Value	Valuable	Limited Value	Little Value	Not Available
School Plan	40%	36%	17%	3%	4%
District Plan	40%	38%	10%	3%	9%

Curriculum Delivery

To determine how much instruction is currently delivered using some form of educational technology, respondents were asked to estimate for thirteen (13) subject matter areas the percentage of instruction involving integration of educational technology. Business education courses make the most use of technology in the curriculum. Science, special education, and Chapter One also reported that over fifty percent (50%) of the curriculum is delivered using educational technology.

Chart 9 - Estimate of Curriculum Delivered Using Educational Technology

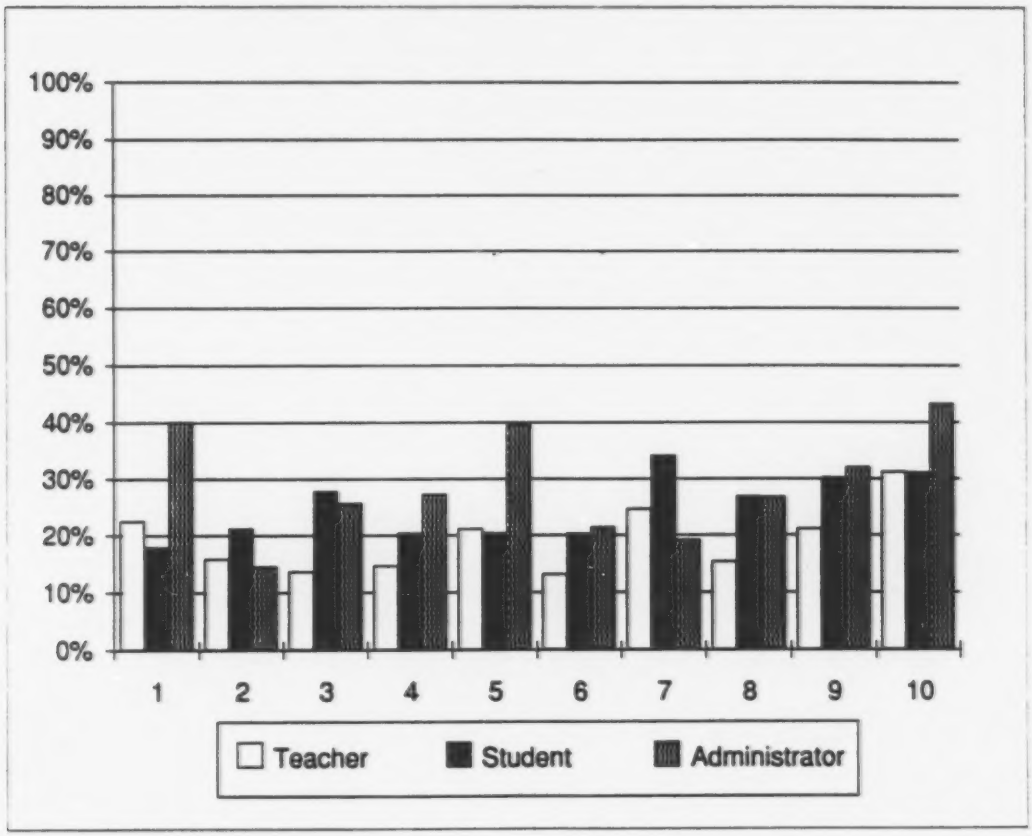


1 Language Arts (reading, writing, English)
2 Mathematics
3 Science
4 Social Studies
5 Bilingual Education
6 Foreign Languages
7 Performing Arts
8 Health
9 Special Education
10 Physical Education
11 Chapter One
12 Vocational Education
13 Business Education

Software Use

Each respondent estimated the percentage of software programs used. Comparing the columns reveals marked differences in computer use between teachers, students, and administrators.

Chart 10 - Average Percentage of Computer Software Use



1 Analytic and Information Tools (i.e., Databases & Spreadsheets)
2 CAD/CAM
3 Computer Literacy & Programming Languages
4 Desktop Publishing
5 Managing Individualized Instruction
6 Multimedia/Hypermedia
7 Individual (Drill & Practice, Tutorial)
8 Individual (Problem Solving & Simulations)
9 Integrated Curriculum Package
10 Word Processing

IV. Staff Development

Training programs for teachers and administrators are critical for effective integration of educational technology.

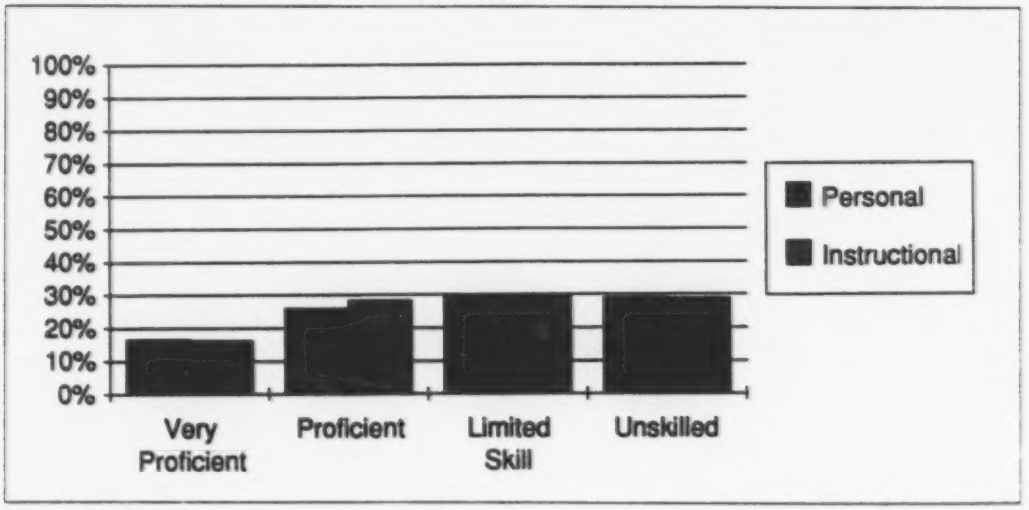
In this section of the report, several factors related to staff development are examined. First, faculty computer competency is graphed. Second, the training background of technology users is presented. Finally, staff development training needs are identified.

Faculty Competence

Faculty computer competence is rated on a scale of unskilled to very proficient, and is divided into two components -- personal productivity and instructional use. Personal productivity refers to using the computer for word processing, grade and record keeping, and lesson plan development. Instructional use means employing the computer to manage and/or deliver instruction in the classroom.

Sixty percent (60%) of the faculty are rated as having limited skill or being unskilled for both personal productivity and instructional use. This emphasizes the need for additional faculty training.

Chart 11 - Estimate of Faculty Computer Competence

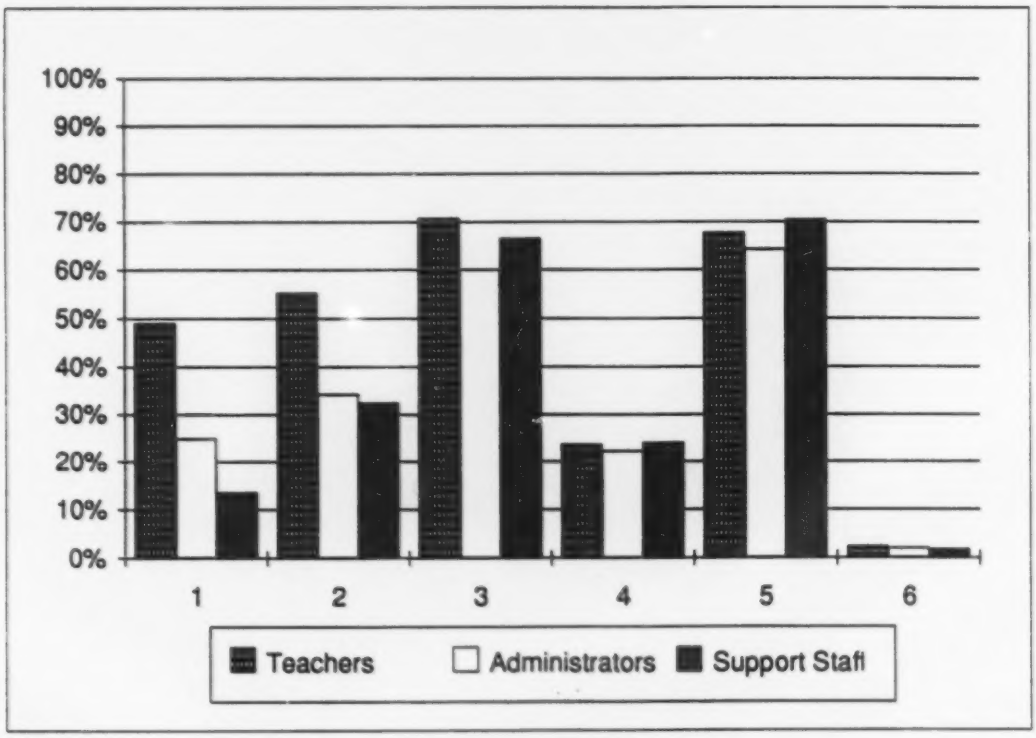


Training Background

Staff development in educational technology is important for two reasons. First, abundant technologies have recently become available, and training is necessary in order for staff to learn how to use these new tools. Second, the new technologies were unavailable when most teachers and administrators received their pre-service education. Therefore, continuous training is important.

Chart 12 presents the various modes of training and the percentage of staff who have received training. Respondents indicated that the final column labeled **Other** represents learning from family members and also self taught technology users.

Chart 12 - Training Background of Technology Users

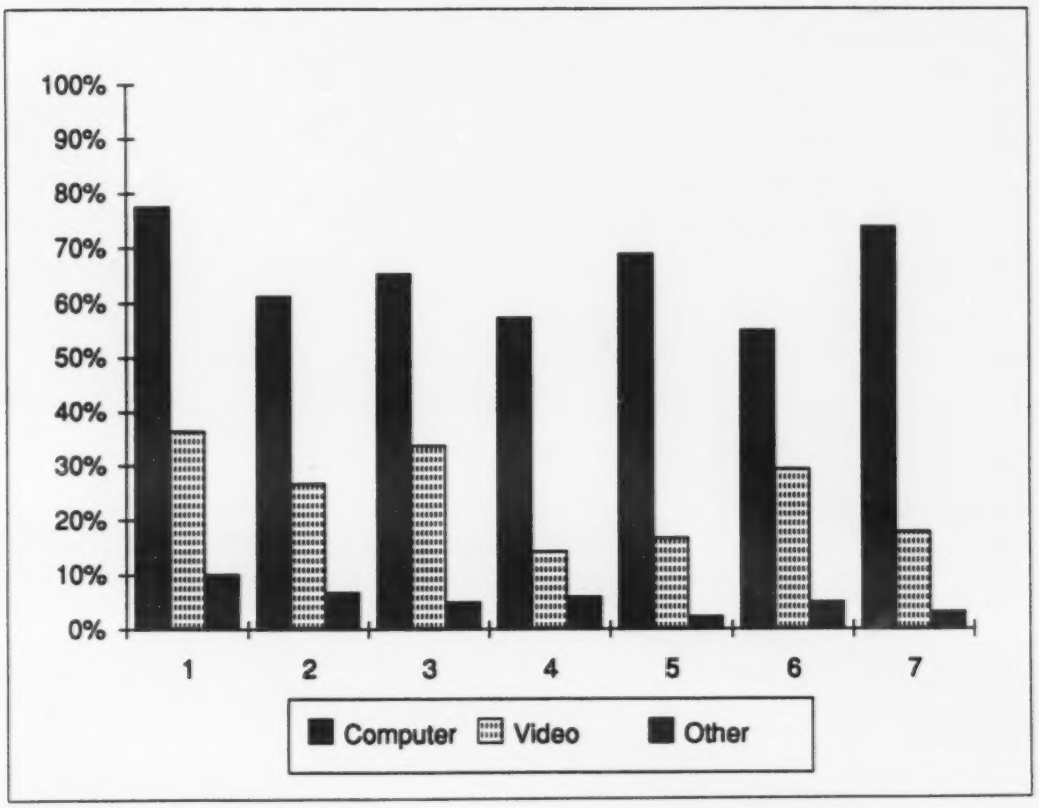


1 Part of College Degree
2 Continuing Education Courses
3 Inservice Training
4 Vendors
5 On-the-job Training
6 Other

Staff Development Needs

The staff development needs for training in computers, video, and other technologies are presented in Chart 13. Respondents identified specific topics in the column labeled **Other** as training in areas such as telecommunications, instructional television, computer aided design, hypermedia, multimedia, computer screen projection, and networking. Training in microcomputers is the area of greatest need across all seven categories.

Chart 13 - Identified Staff Development Needs



1 Integrating Technology into the Curriculum
2 Operating the Equipment
3 Selecting the Appropriate Materials
4 Using Technology to Support School Administration
5 Using Technology to Support Teachers' Administrative Tasks
6 Acquiring Information about Educational Technology Resources
7 Software Applications

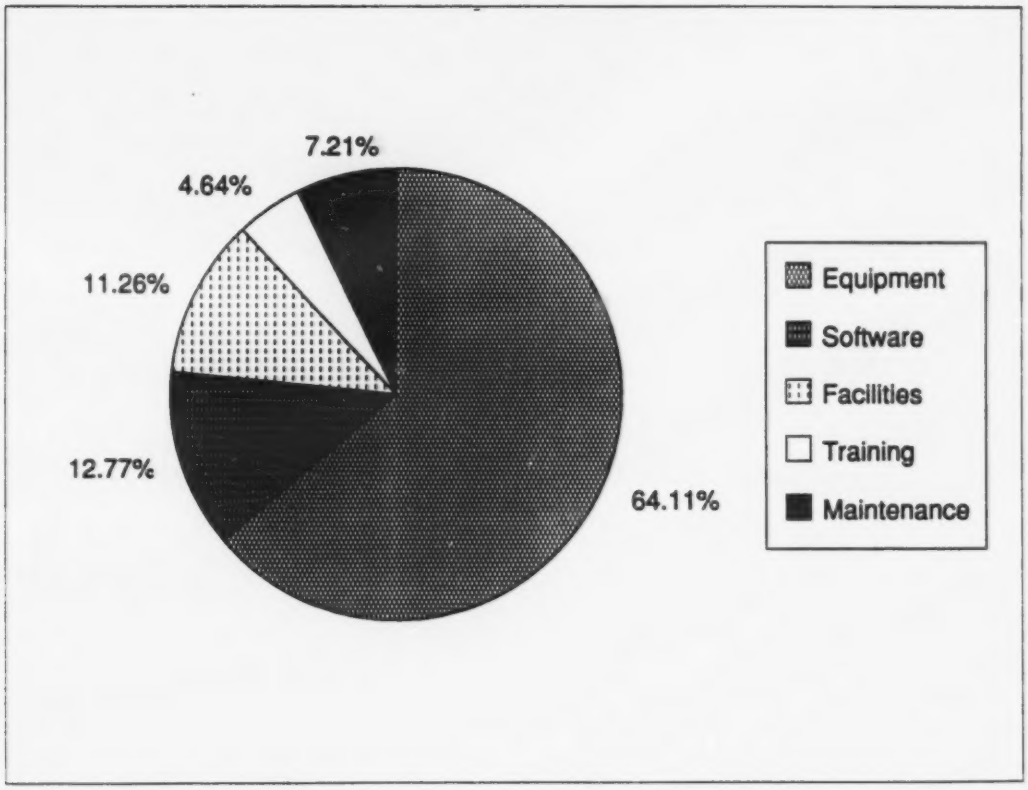
V. FUNDING

An important part of the survey was to examine funding for educational technology. How much is being spent on educational technology and what is the source of the funding? Questions in the survey were designed to measure funding priorities and to project possible funding trends over a three-year period.

Educational Technology Expenditures

When looking at funding by category, a majority of expenditures is made for equipment. Software and facilities are the next two largest expenditure categories. Training is the lowest spending category. Chart 14 represents categories of expenditures.

Chart 14 - Expenditure Categories



Source and Amount of Funding

Schools were asked, "In this school year (1990-91), what was the dollar amount of funds available for educational technology at this school from each of the following sources? (Donated equipment, materials, and services should be included at fair market value.)"

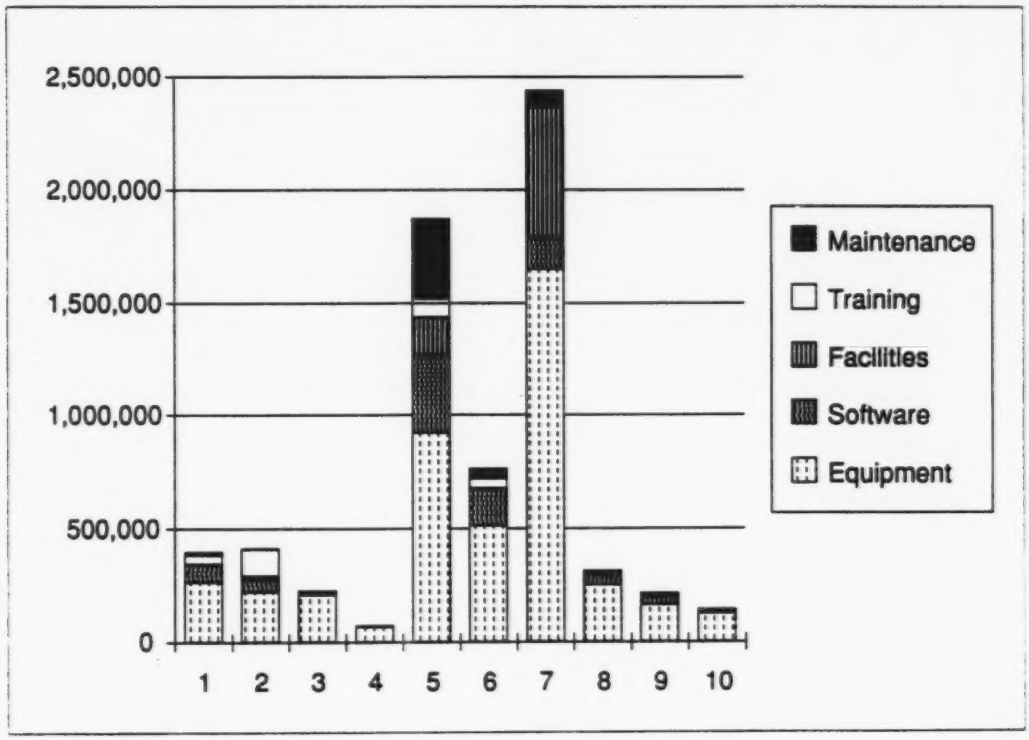
Table 6 represents the aggregate funding data for those schools able to answer this complex question which involved fifty (50) data entry points.

Table 6 - 1990-91 Educational Technology Funding

	Equipment	Software	Facilities	Training	Maintenance
Federal Grant	266,539	76,940	0	42,020	12,000
State Grant	223,747	49,700	17,400	119,240	3,600
Corporate Grant	211,276	11,000	0	6,300	600
Business Partnership	68,095	5,500	400	100	0
District Budget	920,365	347,801	168,000	85,756	352,801
Federal Program	512,488	160,785	1,009	44,065	42,045
Bond/Mill Levy	1,653,605	139,810	572,908	200	74,715
Donations	254,720	35,740	6,000	13,100	6,100
Discretionary	164,949	33,045	7,525	6,865	3,300
Other	126,100	16,286	0	1,100	0
Total	4,401,884	876,607	773,242	318,746	495,161

Chart 15 graphically represents the funding sources for educational technology presented in Table 6. The largest funding source is the bond/mill levy, followed closely by the district budget. These two categories represent over half the total funds spent on educational technology.

Chart 15 - Sources for 1990-91 Educational Technology Funding



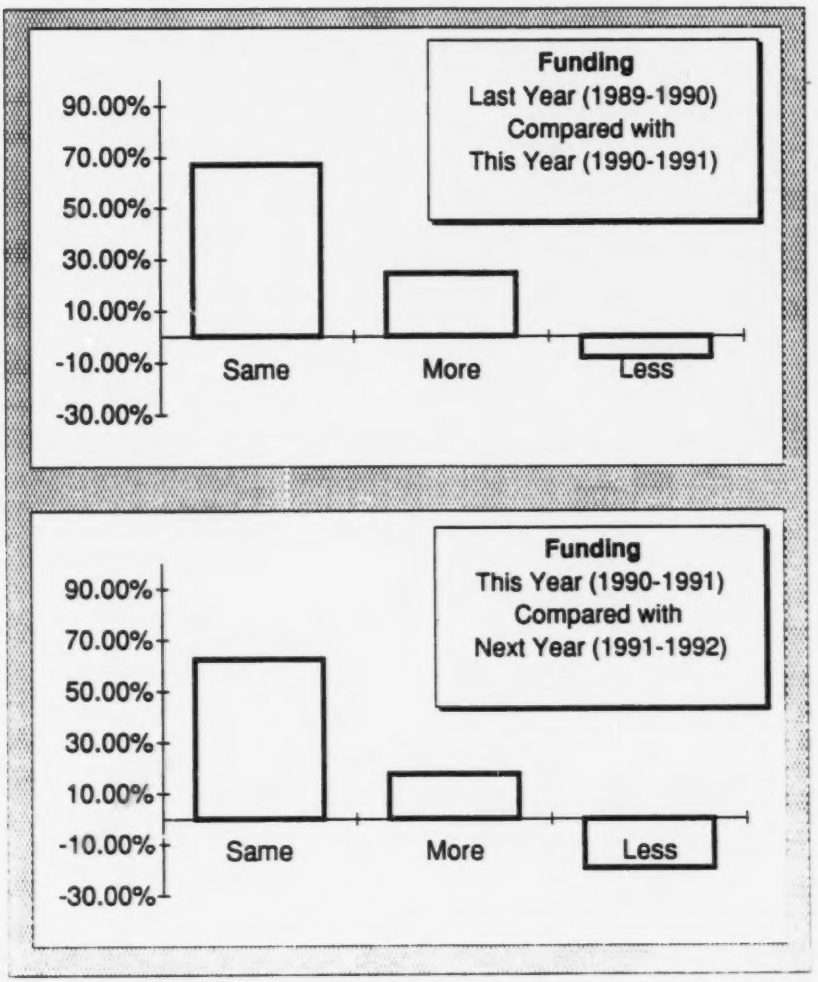
1 Federal Grant
2 State Grant
3 Corporate Grant
4 Business Partnership
5 District Budget
6 Federal Program
7 Bond/Mill Levy
8 Donations (i.e., PTA, Community)
9 School Discretionary Funds
10 Other

Funding Trends

In order to determine funding trends for educational technology, schools were asked to compare funding levels for this school year (1990-1991) with the previous year (1989-1990) and to estimate funding for next year (1991-1992). Respondents were asked to estimate the difference if it exceeded plus or minus ten percent (10%).

Chart 16 represents a slight down trend in the amount of funding for educational technology.

Chart 16 - Funding Trends



Priorities for Funding

The priorities identified for educational technology funding are listed in Table 7. Respondents ranked funding priorities for their schools from first through ninth.

As verified in Chart 4 - Number of items requested, computer equipment is the top identified priority for educational technology funding. The number two priority, labeled *Other* on the questionnaire, respondents identified as library management, networking, multimedia, laser disks, and video disks.

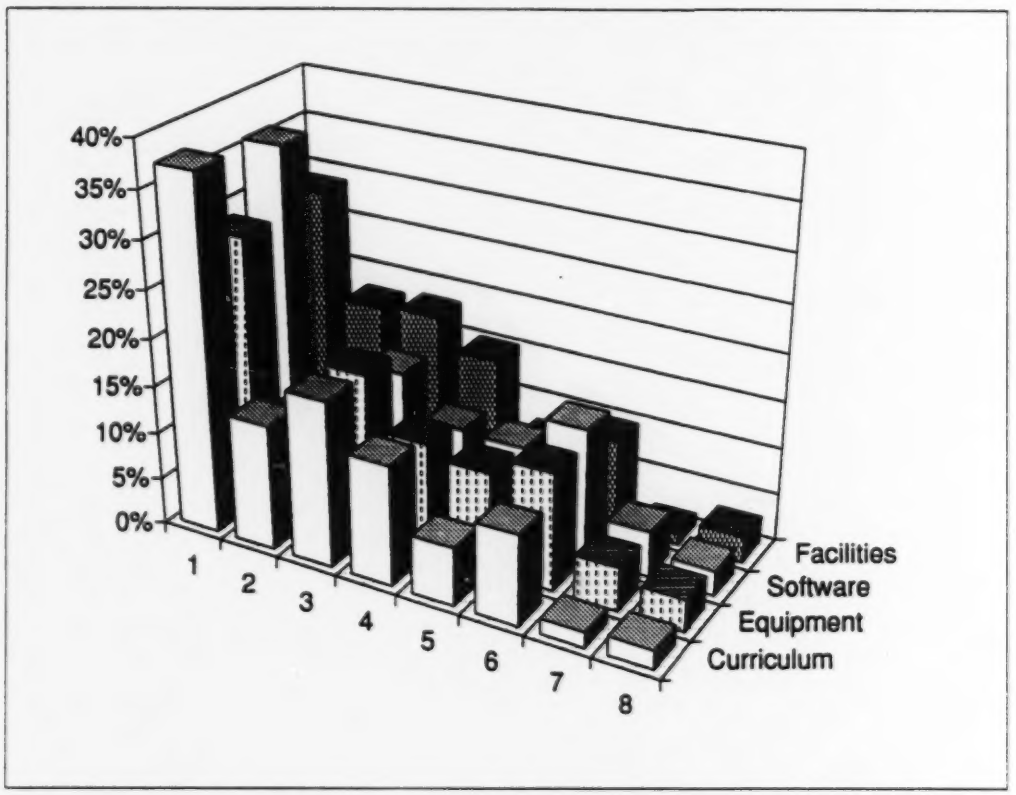
Table 7 - Priorities for Educational Technology Funding

1. Computer Equipment
2. Other (library management, networking, multimedia, laser disks, and video disks)
3. Computer Software
4. Faculty/staff Technology Training
5. Video Equipment
6. Video Programs
7. Modifications of School Plant
8. Telecommunications
9. Faculty/staff Video Training

Decision Makers

Schools were asked to indicate who had the most influence in assisting the principal to make decisions about educational technology applications. The question was designed to provide insight into the process of educational technology planning. As displayed in Chart 17, department chairs and individual teachers have the most influence in making decisions about educational technology. School and district committees also play an important role in making decisions about educational technology.

Chart 17 - School Level Decisions

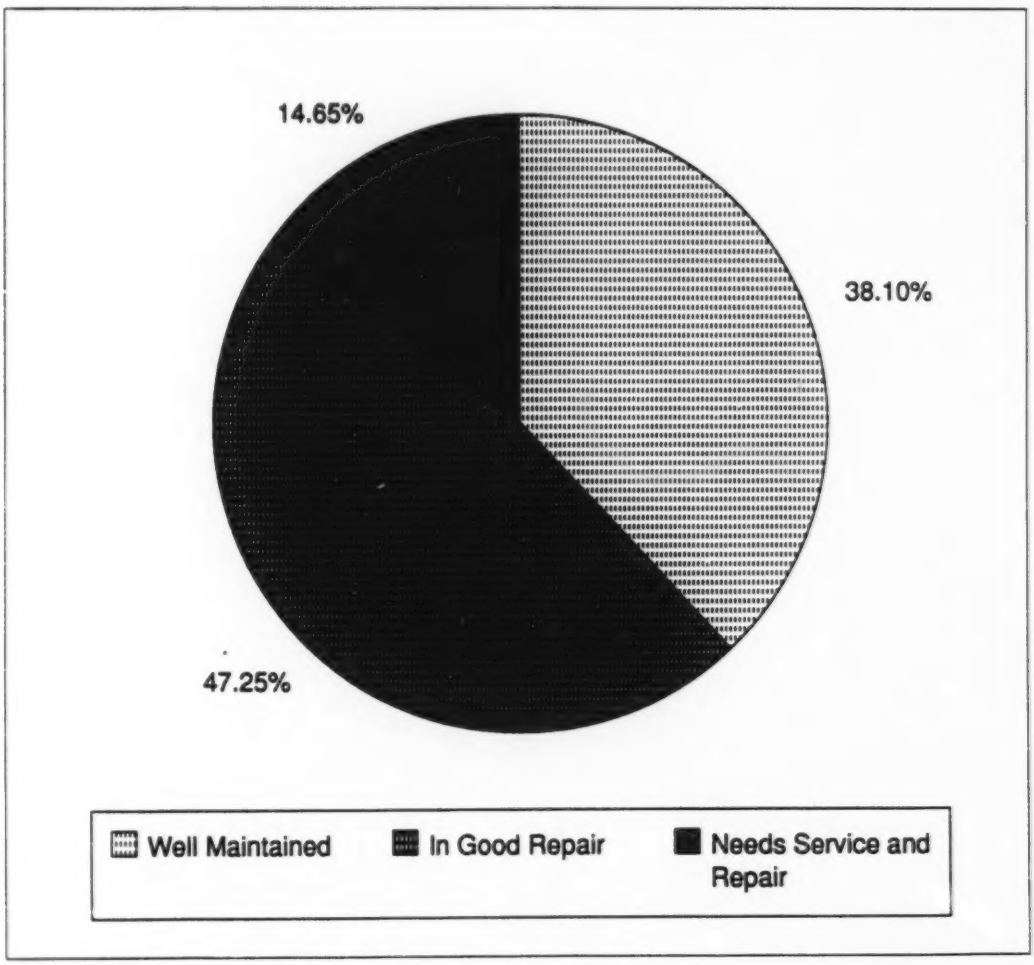


1 Department Chairs and Individual Teachers
2 School Plan
3 School Committee
4 District Committee
5 District Technology Specialist
6 School Technology Specialist
7 Vendors
8 Other

Maintenance of Equipment

Despite the low dollar amounts spent on educational technology maintenance and service ($1,465 per school site for 1990-91), eighty-five percent (85%) of the respondents feel their technology equipment is in good repair or well maintained. This can partly be attributed to the fact that most of the equipment is relatively new. Less than fifteen percent (15%) report that more funding is needed because their educational technology equipment needs service and repair.

Chart 18 - Educational Technology Equipment



VI. Innovative Applications

As identified by respondents, highlighted below is a representative sample of innovative programs and applications of technology in New Mexico schools.

- *We received a grant from Department of Energy (DOE $25,500 for 5 schools) which has allowed us to implement a central system which connects us, via telephone to four elementary schools and our middle school feeder. Students and teachers in these five schools are in communication with each other!*

  Dolores Gonzales Elementary, Albuquerque Schools

- *Muppet keyboard with Special Education and Kindergarten, Echo and Euphonic speech synthesizers with blind and bilingual students, video taping of teachers for evaluations and modeling, telecommunication for research and development.*

  Central Elementary, Bloomfield Schools

- *Multi-media lab used by all students at least 30 minutes daily. The Chapter 1 students receive 60 minutes daily.*

  Alvis Elementary, Clayton Schools

- *We have recently added a Macintosh LC with a CD ROM and a video disk player to our media center.*

  Marshall Junior High, Clovis Schools

- *Available software/hardware for each subject area for use by students for any given project or assignment. Availability at all times.*

  Lockwood Elementary, Clovis Schools

- *We have used the Ty-In Network to provide classes. There is also a computer lab and computers in every classroom on campus. The Satellite System is used to receive educational programs.*

  Corona Schools

- *Our school was one of the Kids Net Project pilot schools and we continue to participate in the program sponsored by National Geographic Society.*

  Indian Hills Elementary, Gallup-McKinley Schools

- *Computer labs and installation of Channel 1 TV*

  Highland Junior High, Hobbs Schools

- *Onate is a very high-tech school with a wide variety of innovative technology applications available to students and teachers.*

  Onate High, Las Cruces Schools

- *1) Take home computers through Chap. 1. 2) Write to Read - Chap 1. 3) Use of Adaptive equip. for physically impaired. 4) Computer classes in after school program.*

  Alameda Elementary, Las Cruces Schools

- *We have a computer assisted drafting program that is very popular among industrial technology students.*

  Lordsburg High, Lordsburg Schools

- *We were able to begin one media center with computerized circulation which has led to a more efficient method for all concerned.*

  K. Gallegos Elementary School, Los Lunas Schools

- *We have just started using the World Book Info. Finder on CD-ROM. We have integrated a Macintosh based CD-ROM "Yoda Curriculum" on image processing in an 8th grade science class. We have integrated all core areas directly to our computer labs.*

  La Plata Middle School, Silver Consolidated Schools

VII. Summary of Findings and Conclusions

Presented in this chapter is a summary of the findings and conclusions based on information from the data analysis and the following open-ended questions from the questionnaire:

1) What are the plans for improving use of technology to achieve your educational goals?
2) What problems or obstacles do you anticipate in improving the effectiveness of technology in your school?
3) What is your vision for using educational technology in your school?
4) Please briefly describe innovative technology applications at your school, and
5) How are parents and/or other adult community members involved in school technology programs?

Summary of Findings

This study presents a compelling story of information about the state of educational technology in New Mexico schools. Between individual school sites there is a wide range in the level of available educational technology. Some schools have very limited educational technology resources while others are using technology extensively.

Computers are by far the most widespread and most requested educational technology in New Mexico schools. These tend to be located in classrooms and, to a lesser degree, in laboratories. The audioplayer and television are the second and third most common technology. Newer technologies such as computer projection equipment and laser disks are uncommon.

Apple II series computers are the most common computer found in schools. Macintosh is far less common; however, sixty-four percent (64%) of New Mexico schools have Apple computers. IBM and compatibles represent thirty percent (30%) of the installed base of microcomputers.

A few schools in New Mexico are equipped to provide full motion two-way video, audio, and data transmission. However, distance learning options for most students are very limited. For example, only ten percent (10%) of the schools reported having a modem for telecommunications.

It was estimated that over half the students have access to a Video Cassette Recorder at home while about fifteen percent (15%) have access to a computer.

Long-range plans for integrating technology into the classroom need to be developed at each school site. Schools indicating they had educational technology plans rated the plans as valuable or of great value seventy-five percent (75%) of the time.

Business education and Chapter One classes have the largest estimated percentage (38% and 25%, respectively) of instruction delivered using computer technology. Interestingly, when looking at the amount of curriculum presented using all types of educational technology, respondents estimated that each curriculum area is using educational technology an average of at least thirty percent (30%) of the time.

Students most commonly use software for practice and tutorial (34%) and word processing (31%). Computer literacy and problem solving are also important software tools for students. Teachers use word processing most often, while administrators use database, spreadsheet, instructional management, and word processing software.

The need for staff development is high. When rating teachers' proficiency levels for computer use, nearly two thirds of the schools reported that teachers have limited or no computer skills. Inservice and on-the-job training are the most common forms of staff development in educational technology. Vendors are the least common source of training.

Across all types of technology, training in integrating technology into the classroom is the primary staff development need. The need for computer training is more critical than training about video technology.

Results of the report indicate that educational technology funding comes from a variety of sources. It was encouraging to note that the second largest source was the district budget. This indicates that educational technology has become an integral part of the school budget process. The largest funding source is bond/mill levies, which are primarily used to purchase equipment. With the strong need for training, it was surprising to note that staff development receives the least amount of funding.

The trend in educational technology funding is down slightly over the three year period from school year 1989-1990 to 1991-1992. However, longitudinal data collected over a five to ten year period is needed in order to make any judgments about significant trends in educational technology spending.

The top identified priorities for technology funding in schools are computer equipment and software. The next priorities are faculty/staff training followed by video equipment and programs. Modifications of the school plant, telecommunications, and video training are rated as the lowest priorities.

The process of assisting principals in making decisions about educational technology usually involves the department chair, individual teachers, and committees. School plans and technology specialists also play an important role in helping the principal to make decisions.

About eighty-five percent (85%) of the educational technology equipment in New Mexico schools is considered to be well maintained or in good repair. This can partly be attributed to the fact that most of the equipment is relatively new.

There is a wide variety of innovative technology applications in rural and urban schools throughout New Mexico. These range from a Department of Energy grant for telecommunications to a project that integrates all core curriculum areas directly into the computer labs.

Conclusions

- Teachers, principals, and other staff are often inspired and motivated by the potential of educational technology applications in reaching learning outcomes.
- Parents and community members are involved in planning as well as assisting with identification of technology applications to meet specific student and staff needs.
- A majority of schools reported plans to increase the use and integration educational technology into administrative functions and the learning/teaching process. A few schools reported no plans for improving the use of instruction by using technology due to lack of funding.
- Teachers are beginning to use software that: 1) makes the classroom less teacher-centered and more student-centered; 2) opens the world to the classroom through telecommunications; 3) actively involves students in doing and creating projects; 4) helps students do more thinking, interpreting, and analyzing; 5) gives students more individualized instruction; and 6) encourages team-centered research.
- Faculty, staff, and administrator training in technology should be carefully planned and based on identified needs. Follow-up is an important part of staff development programs which is often omitted.
- Research in new software and hardware should recognize the uniqueness and individuality of the school environment and be designed accordingly.
- Resistance to change can be a major obstacle to implementing technology.
- Educational technology can be a catalyst and an integral part of much broader systemic change for improving education.
- To fully implement technology into the learning process, there is a strong need for additional funding, staff development, and support.

Appendix A: Glossary of Terms

Assistive Technology	Any item, piece of equipment, or project system to increase, maintain, or improve functional capacities of individuals with disabilities.
Audioplayer	A record player or tape player/recorder.
CD ROM	Compact disk read-only memory: small hard disks used for computer storage of text and audiovisual materials.
CAD/CAM	Computer aided design, computer assisted manufacturing: computer work stations equipped with software packages to facilitate engineering, drafting, graphics composition, and/or manufacturing processes control.
Computer projection Equipment	Machine connected to a computer which projects what appears on the monitor onto a large screen.
DOS	Disk operating system: the internal programs that allow the computer to use a disk system.
ITFS	Instructional television fixed service: microwave broadcast
Integrated curriculum package	Educational technology materials integrated with regular curriculum.
Laboratory	Room intended primarily for student use of computers.
LAN	Local area network(s): data transmission lines linking a series of computers so that users can access a central file server memory and/or be centrally controlled.
Laser disk	Large optical disk player which is controlled by a microprocessor and is used for presentation of graphics, still and motion photography, and sound programs.
MS DOS	Microsoft disk operating system. Used on IBM, Tandy, and clones.
Modem	An electronic device, or interface, which allows computers to communicate via telephone lines.
WAN	Wide area network(s): voice and data communications capability using a modem to a distant site.

Appendix B: List of Schools that Responded

This appendix contains a list of survey respondents by public school district. In a number of instances, a combined response was submitted which represents a district-wide response.

District Responses

Artesia Public Schools
Cloudcroft Municipal Schools
Corona Municipal Schools
Dexter Consolidated Schools
Dulce Independent Schools
Elida Municipal Schools
Espanola Public Schools
Floyd Municipal Schools
Grady Municipal Schools
Hagerman Municipal Schools
Jemez Mountain Public Schools
Lake Arthur Municipal Schools
Logan Municipal Schools
Magdalena Municipal Schools
Melrose Public Schools
Mesa Vista Consolidated Schools
Mosquero Municipal Schools
Raton Public Schools
Reserve Independent Schools
San Jon Municipal Schools
Wagon Mound Public Schools

Alamogordo Public Schools

Holloman Elementary
La Luz Elementary
Oregon Elementary
Chaparral Junior High

Albuquerque Public Schools

A. Montoya Elementary
Apache Elementary
Armijo Elementary
Atrisco Elementary
Bandelier Elementary
Chaparral Elementary
Comanche Elementary
Dolores Gonzales Elementary
Edmund G. Ross Elementary
Eugene Field Elementary
Hubert H. Humphrey Elementary
John Baker Elementary
La Luz Elementary
La Mesa Elementary
Los Padillas Elementary
Mark Twain Elementary
Matheson Park Elementary
Monte Vista Elementary
Mountain View Elementary
S. R. Marmon Elementary
Osuna Elementary
Ranchos Elementary
Wherry Elementary
Zia Elementary
Ernie Pyle Middle
Garfield Middle
Grant Middle
Hayes Middle
Jackson Middle
Madison Middle
Polk Middle
Taft Middle
Taylor Middle
Van Buren Middle
Wilson Middle
Del Norte High
La Cueva High
Manzano High
Rio Grande High
Valley High
West Mesa High
Albuquerque Evening

Animas Public Schools

Animas Elementary
Animas High

Aztec Municipal Schools

McCoy Avenue Elementary
C. V. Koogler Junior High
Aztec High

Bernalillo Public Schools

Algodones Elementary
Cochiti Elementary
Placitas Elementary
Santo Domingo Elementary
W. D. Carroll Elementary
Bernalillo Mid

Bloomfield Municipal Schools

Central Elementary
Naaba Ani Elementary
Rio Vista Elementary

Capitan Municipal Schools

Capitan Elementary

Carlsbad Municipal Schools

Dr. E.M. Smith Elementary
Edison Early Childhood Education Center
Hillcrest Elementary
Monterrey Elementary
Pate Elementary
Puckett Elementary
Riverside Elementary
Sunset Elementary
Alta Vista Middle
P.R. Leyva Junior High
Carlsbad High

Central Consolidated Schools

Natanni Nez Elementary
Nizhoni Elementary
Ojo Amarillo Elementary
Ruth N. Bond Elementary
Kirtland Middle
Newcomb Junior High
Tse'Bit'ai Middle
Kirtland High
Shiprock High

Chama Valley Independent Schools

Canjilon Elementary
Tierra Amarilla Elmentary
Escalante High

Cibola County Schools

Bluewater Elementary
Milan Elementary
Los Alamitos Middle
Grants High
Laguna Acoma High

Cimarron Municipal Schools

Cimarron Elementary
Eagle Nest Elementary
Cimarron High

Clayton Public Schools

Alvis Elementary
Kiser Elementary
Clayton Junior High

Clovis Municipal Schools

Barry Elementary
Bella Vista Elementary
Cameo Elementary
Highland Elementary

Clovis Municipal Schools
(continued)

James Bickley Elementary
La Casita Elementary
Lincoln Jackson Elementary
Lockwood Elementary
Parkview Elementary
Ranchvale Elementary
Sandia Elementary
Zia Elementary
Marshall Junior High
W D Gattis Junior High
Yucca Junior High
Clovis High

Cobre Consolidated Schools

Central Elementary
Cobre High

Cuba Independent Schools

Cuba Elementary
Cuba Middle
Cuba High

Deming Public Schools

Chaparral Elementary
Columbus Elementary
Martin Elementary
Sunshine Elementary
Deming High

Dora Consolidated Schools

Dora Elementary

Estancia Municipal Schools

Estancia High

Gadsden Independent Schools

La Union Elementary
Mesquite Elementary
Gadsden High

Gallup-McKinley County Schools

Church Rock Elementary
Crownpoint Elementary
Indian Hills Elementary
Jefferson Elementary
Juan de Onate Elementary
Lincoln Elementary
Roosevelt Elementary
Smith Lake Elementary
Tohatchi Elementary
John F. Kennedy Middle
Crownpoint High
Navajo Pine High
Thoreau High

Hobbs Municipal Schools

B. T. Washington Elementary
Broadmoor Elementary
Coronado Elementary
Edison Elementary
Jefferson Elementary
Mills Elementary
Southern Heights Elementary
Stone Elementary
Taylor Elementary
Heizer Junior High
Highland Junior High
Houston Junior High
Hobbs High

Jal Public Schools

Jal Elementary

Jemez Valley Public Schools

Jemez Valley Elementary
Jemez Valley High

Las Cruces Public Schools

Alameda Elementary
Conlee Elementary
Dona Ana Elementary
East Picacho Elementary
Fairacres Elementary
Hermosa Heights Elementary
Hillrise Elementary
Loma Heights Elementary
MacArthur Elementary
Mesilla Park Elementary
Tombaugh Elementary
University Hills Elementary
Valley View Elementary
Washington Elementary
Lynn Middle
Picacho Middle
Las Cruces High
Mayfield High
Onate High
San Andres High

Las Vegas City Public Schools

Los Ninos Elementary
Mora Avenue Elementary
Paul D. Henry Elementary
Sapello Elementary
Sierra Vista Elementary
Memorial Middle
Robertson High

Las Vegas West Public Schools

Armijo Elementary
Conchas Dam Elementary
Don Cecilio Martinez Elementary
OLO Sorrows Elementary
Union Elementary
West Las Vegas Middle
West Las Vegas High

Lordsburg Municipal Schools

Central Elementary
Southside Elementary
Traylor Elementary
Dugan-Tarango Middle
Lordsburg High

Los Alamos Public Schools

Aspen Elementary
Barranca Mesa Elementary
Los Alamos Middle

Los Lunas Public Schools

Bosque Farms Elementary
Katherine Gallegos Elementary
Raymond Gabaldon Elementary
Los Lunas High

Loving Municipal Schools

Loving Elementary
Loving High

Lovington Public Schools

Ben Alexander Elementary
Jefferson Elementary
Lea Elementary
Llano Elementary
Yarbro Elementary
Taylor Middle School
Lovington High

Mora Independent Schools

Mora High

Moriarty Municipal Schools

Edgewood Elementary
Moriarty Elementary
Mountainview Elementary
Moriarty Middle

Mountainair Public Schools

Mountainair Elementary
Mountainair High

Pecos Independent Schools

Pecos Elementary
Pecos Mid
Pecos High

Pojoaque Valley Public Schools

Pojoaque Elementary
Pojoaque Middle
Pojoaque High

Portales Municipal Schools

Brown Elementary
James Elementary
Lindsey Elementary
Steiner Elementary
Portales Junior High
Portales High

Roswell Independent Schools

Del Norte Elementary
Military Heights Elementary
Monterrey Elementary
Sunset Elementary
Mesa Middle
Sierra Middle
Goddard High
Roswell High
University High

Ruidoso Municipal Schools

Ruidoso Middle

Santa Fe Public Schools

Chaparral Elementary
Kaune Elementary
Santa Fe High
Santa Fe Tech

Santa Rosa Consolidated Schools

Santa Rosa High

Silver Consolidated Schools

Cliff Elementary
La Plata Middle
Cliff High

Socorro Consolidated Schools

Zimmerly Elementary
Socorro High

Special State-Supported Schools

Diagnostic & Development Center
New Mexico Military Institute
Secure Treatment Center

Springer Municipal Schools

Springer Elementary
Springer High

Taos Municipal Schools

Taos High

Truth or Consequences Municipal Schools

Arrey Elementary
T or C Middle
Hot Springs High

Tucumcari Public Schools

Granger Elementary
Mountain View Elementary
Tucumcari High
Tucumcari Junior High

Tularosa Municipal Schools

Tularosa Elementary
Tularosa Junior High
Tularosa High

Zuni Public Schools

Twin Buttes High